CONFIRMED MINUTES

IHRA SIDE IMPACT WORKING GROUP

8th MEETING

LONDON

12-13 JUNE 2000

1. ATTENDEES

Keith Seyer	(Chair)	Department of Transport & Regional Services, Australia
Mark Terrell	(Secretary)	Department of Transport & Regional Services, Australia
Dainius Dalmotas		Transport Canada
Suzanne Tylko		Transport Canada
Richard Lowne		EEVC
Joseph Kanianthra		National Highway Traffic Safety Administration, USA
Stuart Southgate		OICA North America / AAM
Rainer Justen		OICA Europe
Takahiko Uchimura		OICA Asia Pacific / JASIC / JAMA
Risa Scherer		WorldSID Task Group
Haruo Ohmae		JARI
Takeshi Harigae		JARI
Hideki Yonezawa		JMoT
Mike Ashmead		Cellbond (Day 1)
Patrick Gay		Cellbond (Day 1)

APOLOGIES

Robert Hultman – retiring, OICA North America and AAM being represented at this meeting by Mr Southgate.

Mr Ohmae advised that he is moving to another department. His successor was not available for this meeting, however will hopefully be present for the next meeting.

The Chairman thanked both Mr Hultman and Mr Ohmae for their considerable contribution to the Working Group.

2. MODIFICATIONS TO AGENDA

Item 5.1 (Cumulative distribution of struck vehicle velocity for struck side impacts involving rear seat passengers for low severity serious injury and fatal crashes) presentation from JARI was deleted and replaced by a presentation of some additional data from EEVC.

Item 5.2 (Presentation of Mercedes Benz results on non-struck side and rear seat accident investigation) was added.

Item 7.1a (EEVC progress on specification of MDB face) was added

Item 7.2a (Test results with SID IIs and interior head impact tests) was added

Item 7.5 (Results from dynamic OOP and effectiveness tests for side airbags) was deleted as NHTSA have not completed tests – results should be available for next meeting

Item 7.6 (Representative pole and vehicle profiles) presentation by Transport Canada was added

The revised agenda was accepted as amended. The modified agenda has Document Number SIWG 86 rev 2.

3. MINUTES OF THE PREVIOUS MEETING

The draft minutes of the seventh meeting, held in Madrid, Spain were amended, approved and confirmed.

4. REPORT FROM WorldSID TASK GROUP

WorldSID Workshop Timing

Mr Seyer advised that the WorldSID workshop, planned for October, had been delayed to the week of 4-8 December. Therefore there was a need to consider a time for the next meeting prior to that date, possibly aligned with the IRCOBI conference in France. He asked members to consider this proposal during the course of the meeting.

Mr Uchimura informed the meeting of the current status of the WorldSID project after the Task Group meeting of 5-6 June.

Mr Hultman will be retiring in the near future and therefore will no longer be involved in WorldSID.

The development timeframe has been changed as follows:

- Workshop moved from October to 4-8 December
- Full vehicle crash test will be conducted on 1 December, prior to the workshop
- Sled test will be conducted during the workshop

The current state of development was reviewed at the Task Group meeting with presentations from each of the design teams.

The interaction with the IHRA Side Impact Working Group was discussed. The Task Group is currently working with the criteria in ISO TR9790, however there was discussion of new requirements that may come from the IHRA Biomechanics

Working Group. The Task Group will continue to work to ISO TR9790 for the prototype dummy, but will consider any output from the IHRA Biomechanics group for development of the production dummy.

Mr Uchimura pointed out that communication between the groups was important as the final goal is for the dummy to be used in an internationally harmonised regulation.

The price of pre-production dummies is based on an estimate of 12 dummies required. The current commitment is less than 12, therefore commitment is required from further organisations if the current price estimate is to be maintained.

4.1 Biomechanics Working Group Meeting

Mr Dalmotas presented a brief outline of the IHRA Biomechanics meeting held in Washington.

The meeting had discussed how to meet the obligation for the two reports required by the end of July. The following report sections will be due in mid-July:

- Anthropometry (Australia) (completed)
- Field accidents report (Canada)
- Impact response corridors (NHTSA)
- Inventory of available injury criteria – preliminary (INRETS)

The next meeting of the group will be in Versailles on 18 September 2000.

5. PRESENTATION OF ACCIDENT STUDIES

5.1 EEVC Presentation of additional data

Mr Lowne presented some analysis of real world crash data investigating the influence of struck vehicle longitudinal velocity change on the cumulative number of cases. The observations were that the number of injury cases increases with an increase in velocity change, but there is no increase in fatality cases with increase in struck vehicle velocity change. This is interpreted to suggest that longitudinal velocity change is not an important factor in serious injury crashes. The struck vehicle longitudinal velocity change was zero in all the fatal cases in this sample. Mr Lowne's presentation is Document No **SIWG 88**.

Mr Seyer asked if NHTSA is able to perform a similar analysis using US accident data. Mr Kanianthra suggested that this might have been done already, but that he did not have any data.

5.2 Presentation of Mercedes Benz results on non-struck side and rear seat accident investigation

Mr Justen presented an analysis of injury distribution for struck and non-struck side occupants with the following conclusions:

- Non-struck side are only slightly smaller proportion of occupants than struck side
- Severity of injuries to struck side occupants is much greater
- Only 3% of injured occupants were rear passengers with only 1 case of MAIS 2+ injury
- Therefore there is no relevance for rear occupants in a side impact test

Mr Justen's presentation is Document No SIWG 89.

6. GEOMETRIC STUDIES OF THE FLEET

6.1 Results of FE simulations to determine the stiffness and stiffness distribution of Japanese vehicles

Mr Uchimura presented results from FE simulation of three Japanese vehicle models. The models used were from Honda (Accord with front longitudinal height from 370 – 400mm), Toyota and Nissan.

The observations were:

- The loading by the structure under front longitudinal member to the impacting objects is not negligible amount
- To simulate a striking vehicle with a MDB it is necessary to consider not only the height of the longitudinal, but also the structure underneath this
- JAMA would like to review the MDB to ensure they are comfortable with the design

Mr Uchimura presented a comparison between the MDB to car test and a car to car test. The following cases were tested:

- MDB to Car Ground Clearance 300mm
- MDB to Car Ground Clearance 350mm
- Car to Car Ground Clearance 370mm (longitudinal bottom)
  Lower lateral ground clearance 237 mm and is set back 160mm from front edge of longitudinal

The car to car test produced lower injury numbers. There was little difference between tests for the rear dummy with the car to car test producing slightly lower measures. The non-struck side sill was found to accelerate faster in the car to car test. "Pelvic lead" was observed in the car to car test.

It was suggested that selecting ground clearance of an MDB based on the lower height of the car's longitudinal member does not well simulate actual vehicle crash

conditions and therefore the height of the longitudinal is not an appropriate measure for setting ground clearance of the MDB.

Vehicle Geometry Study – Additional Information

Two further parameters were added to the previous vehicle geometry data
A – Lateral member bottom height
B – Offset from bumper face

Proposed Barrier Face

Mr Uchimura presented a proposed revised barrier face construction. The element is fitted with a bumper element, similar to that of FMVSS 214. There is a desire to keep the element as simple as possible with a view to repeatability.

Mr Dalmotas noted that it is necessary to consider stiffness distribution of the vehicle front – particularly with stiffer vehicles, where location of longitudinals or the bumper beam is most important, as there is little or no crush of such types of striking vehicles in side impact (such as to engage structure underneath the longitudinal).

Mr Dalmotas also suggested that weighting data by people killed would suggest a different geometry to the average vehicle.

Mr Southgate suggested that it is more appropriate to design vehicles to be compatible (eg. blocker beam) than to have a severe test.

Mr Kanianthra questioned whether the group was “kidding itself” trying to produce a barrier design to meet everybody’s needs given the fleet differences around the world.

Mr Dalmotas noted that the goal is the same, independent of the vehicle population – a design that promotes the “right solution” rather than a particular model of car.

Mr Lowne supported this comment.

Mr Seyer noted that Ford Australia have been invited to make a presentation regarding the re-design of the AU Falcon (for ECE R95) to be made at the meeting in Australia in December.

7. TEST RESULTS AND TEST MATRICES

7.1 Behaviour of Aluminium honeycomb under shear loading (Australia)

Mr Seyer and Mr Terrell presented some outcomes of discussions held at TRL on 14 February.

There is a desire to provide a deformable barrier element that will maintain a predictable performance under shear loading, such as experienced in a crabbed

side impact test. It is proposed to conduct a number of controlled dynamic tests on a number of honeycomb specimens of varied design. The presentation (Document SIWG 91) includes a schematic diagram of the proposed test setup and test sample. The samples will be of similar size to one block of the ECE R95 barrier. The specimens will be prepared by Cellbond Composites. It is expected that the results will be presented at the next meeting of the IHRA Side Impact Working Group.

It was suggested at the meeting that a sample representative of the FMVSS 214 element, with cladding as per the test procedure be included, to establish the effect of the cladding material on shear performance. It was agreed that this was a good idea and would be included in the test matrix.

Mr Kanianthra suggested that it might be useful to test a complete barrier in crabbed configuration against a rigid wall, with load measurement on both the trolley and the wall.

Mr Southgate expressed some concern regarding separation of the element blocks in a R95 type element, which had been observed in perpendicular tests. It is felt that this could be increased in a crabbed test – such that barrier performance may differ between vehicles.

Mr Dalmotas suggested that the separation tendency might actually be reduced with crabbing, as all the blocks would tend to move one way, rather than 'bulging'.

Mr Southgate added that the B-pillar might also have a significant effect.

7.2 Test results of EEVC barrier face under crabbed conditions (Japan)

Mr Ohmae presented the results of a series of tests investigating the effects of crabbing. Tests were conducted separately with both struck side and non-struck side occupants. The tests used a Showa multi-layer element with a ground clearance of 300mm. The target vehicle was a typical 4 door Japanese saloon. Tests were conducted using both EuroSID and SID-IIs dummies.

The presentation is Document number SIWG 92.

There was discussion of the shear behaviour of the element in the crabbed test. Some peeling of the element was observed at the rear of the elements. Japan does not believe that there was shearing at the front of the barrier.

Mr Ashmead observed the amount of rotation forces. There was some discussion of the interlayers – Cellbond use a polyester matting to allow some slippage between layers.

Observations of the tests:

- Struck side responses greater than non-struck side for crabbed and non-crabbed test

- Thoracic and abdominal responses are greater for front seat than rear seat
- Head and pelvic response differs by dummy size
- Non-crabbed test responses were greater than crabbed for the front seat
- Non-crabbed test responses were less than crabbed for the rear seat
- EuroSID and SID-IIs showed different responses
- Vehicle deformation is more severe without crabbing
- Barrier face deformation is greater with crabbing
- Shearing of the barrier face was not observed in the crabbed tests

Mr Dalmotas noted that 'punch through' is better reproduced in the perpendicular test. Mr Kanianthra stated that this effect would however be exaggerated for a vehicle with large doors (such as 2-door or long wheelbase). Mr Dalmotas stressed the importance of the 'punch through', as this is what is being observed in SUV crashes.

Mr Dalmotas suggested that the difference between the results with EuroSID and SID-IIs is caused by breakage of the armrest by the EuroSID which does not occur with SID-IIs. This was supported by the lower rib responses, however could also be caused by changes in B-pillar behaviour. Mr Ohmae noted that the deformation of the vehicle was very consistent.

7.1a EEVC Barrier face development

Mr Lowne presented an update on the development of a new specification for the EEVC deformable barrier face.

There was a conclusion that the current performance specification has resulted in a range of designs that perform differently in tests. A decision has been taken to move to one specified design. The best performance was observed from a "progressive" design. The progressive element was observed to have smoother force build-up in unfiltered data. This was seen to be a major advantage over multi-layer designs. Apart from this the results were quite close.

A program of evaluation tests is underway (full car) with the Group of Experts to produce a proposal for a revised design specification.

A document is available on the EEVC website (www.eevc.org).

7.2a Study of upper interior head protection (Japan)

Mr Ohmae presented the results of a study in Japan of injuries from contact with the vehicle upper interior. Injury trends were established from police data.

Vehicles were tested similar to FMVSS 201. There were 5 passenger vehicles and 3 goods vehicles. Only 1 vehicle passed the requirements. This was the only one designed to meet FMVSS 201 – the remaining vehicles were all Japanese domestic market vehicles.

There is some desire in Japan to apply the regulation to some user fitted accessories in addition to the vehicle interior. There is also a desire to limit the test impact points to those relevant to belted occupants only.

Mr Ashmead questioned whether Japan were considering a temperature criterion as part of the test as the behaviour of interior foams and such would be highly temperature dependent. Mr Ohmae confirmed that this was being considered.

Mr Lowne advised that Europe is currently awaiting EEVC work on interior protection – very similar to FMVSS 201.

The presentation is Document number SIWG 93.

7.3 Results of reconstruction test using 2 SID IIs dummies with occupant interaction (Transport Canada)

Ms Tylko presented the results of a crash test reconstruction of a side impact crash involving a 1995 Pontiac Sunbird (target) and a 1998 Ford Econoline van (bullet) where occupant interaction was a source of injury in the real world crash.

The presentation is Document number SIWG 94.

7.6 Investigation of Side Impact Exterior Damage Profiles: Real World vs. Staged – Progress Report (Transport Canada)

Mr Dalmotas presented results of analysis of crush profiles of a range of real world side impact crashes involving side impacts with vehicles and fixed objects. There is a clear trend that head injuries resulting from contact with external objects are almost always from an impacting vehicle – head injuries from narrow objects tend to involve contact with the B-pillar or upper interior.

Mr Kanianthra noted the importance of not just aiming for the head in a pole test – suggesting that an angled test would produce more realistic impacts for head, chest and thorax.

Reconstruction of similar crashes

The tests are looking at accidents that are similar to staged crashes. There was a similar relationship of head contact with the intruding vehicle. Most showed evidence of over-riding of the vehicle sill. These suggest a need to look at a realistic range of intrusion patterns, rather than trying to achieve an ‘average intrusion’.

Series of crash tests

- All tests used a Toyota Camry target vehicle
- Camry v Camry

  - Evidence of lead at the H-point – contrary to field data which suggests that the door collapses inward from the top
- Explorer v Camry
  - Perhaps too severe
  - No current technology would pass this test
- EEVC Barrier
  - Intrusion profile is too flat
  - Function of change in struck vehicle design
  - ie. Current barriers artificially produce a vertical intrusion profile – this is not seen in the real world
- TC Modified Barrier at increased height
  - Wide EEVC barrier, 400mm Ground Clearance, 1365kg
  - Some folding of the door, but not enough
  - Version #2 with doubled stiffness – had little effect
  - Didn't produce extreme of SUV – but SUV is probably greater severity than field data

7.4 Recommendations submitted to NHTSA by the Side Airbag OOP Injury Technical Working Group (NHTSA)

The Working Group was formed by the industry, with IIHS taking the lead role. A test procedure has been developed with static deployment tests in 15 positions. A semi public meeting to be held on June 22, by invitation only. There is a hope that industry will voluntarily follow the suggested procedures. NHTSA is evaluating the potential risks even when the procedures are followed, including variations of positions where risks could be higher.
The testing program noted a problem with replacement of airbags, particularly with different part numbers. In one case an incorrect airbag was supplied.

NHTSA will investigate the effectiveness of side airbags in crashes, using dynamic tests, in collaboration with Transport Canada.

The proposed procedure includes "research values" and "reference values".

8. ISSUES TO BE ADDRESSED IN PROPOSED ELEMENTS OF IHRA SIDE IMPACT TEST PROCEDURE

Mr Seyer informed the group of a requirement for a report to the IHRA Steering Committee by the end of August and suggested that the draft 'position paper' be used as a basis for the report.

Mr Dalmotas commented that he did not feel there was sufficient progress in the group's activity for a clear 'position'.

Mr Seyer acknowledged this, noting that the draft paper had been prepared such as to promote comment and could be used to record areas of agreement and difference in specific areas of the proposed procedures.

Mr Kanianthra mentioned that a NHTSA analysis of NASS data would be available shortly.

8.1 Circulation / presentation / discussion of views of each IHRA participating organisation on the issues in the position paper circulated 16 March 2000

The group collectively edited the position paper, previously circulated by Mr Seyer. The edited document has Document number SIWG 99. The following comments were made in relation to the paper.

Mr Kanianthra suggested that the proposed test procedure too closely specifies conditions such as speed etc. NHTSA felt it is appropriate to specify devices and methods, leaving some freedom to select specific parameters. He suggested a need for a clear understanding of the meaning of “Harmonisation”.

There was consensus that the paper needs to identify the magnitude of harmonisation that is possible, to be included in the conclusions of the document.

Mr Yonezawa expressed concern that it was unclear as to the obligation of members to enforce the outcome of the Working Group.

Mr Seyer responded that the Working Group would be providing a recommended procedure and that the IHRA steering committee would have influence over implementation, but that regulators themselves must choose whether to adopt test procedures.

Mr Yonezawa added that the Japanese delegation understood that the IHRA recommendation would be enforceable, and therefore have an agreed point to which the regulation could be developed.

Mr Seyer noted the regulatory process involved in the UNECE 1958 Agreement, as well as the Australian and US regulatory process – where there are a number of steps that must be conducted before a regulation can be implemented. Mr Seyer added that he envisaged that the recommendations of the Working Group would be put forward to GRSP in Geneva for consideration. As participants of the SIWG are signatories to the 1958 Agreement and/or 1998 Global Agreement, it is expected that each country would provide input into how the recommendations can be made into a harmonised UNECE Regulation or Global Technical Regulation.

Mr Yonezawa noted that the Japanese delegation now understood that the Working Group would produce a recommendation only and that governments would not be forced to adopt the proposed standard, but that governments would be encouraged to adopt the standard.

Mr Uchimura pointed out that JMoT is aware of the resources invested in the IHRA

Side Impact Working Group activities – and would like to see the outcome as a future regulation.

Mr Seyer added that this is what the whole group would like to see.

Report to IHRA Steering Committee

There was some confusion whether the report due on 31 August 2000 for the IHRA Steering Committee was to be the draft ESV paper to be presented next June in Amsterdam. This has now been confirmed to be the case.

Mr Seyer proposed that a draft report be circulated to the Working Group for comment by the end of July, and requested the accident analysis data from Transport Canada by week 3 of July.

Mr Kanianthra will provide a summary of relevant historical research.

Mr Southgate will provide a summary of Mr Hultman's presentation of Vehicle Data (CD – SIWG81).

The chair (Mr Seyer) undertook to write to the chair of the IHRA Biomechanics Working Group to seek a recommendation for a 5th percentile female dummy for use in the procedures developed by the Side Impact Working Group

Selection of Dummies

5th %ile Female Driver

OICA Europe:	Concern that this has not been tested
Japan:	Suggested that the position of the 5th %ile dummy not be specified – ie could be front or rear

A lack of feedback was noted from ISO Working Group 5 on mandate for the development of a 5th percentile WorldSID dummy.

5th %ile Rear Passenger

Canada:	Agreed
NHTSA:	Agreed
JMoT:	Agreed
EEVC:	Agreed – on balance
OICA Nth. Amer.:	Agreed to a child dummy
OICA Europe:	Do not believe necessary
OICA Asia Pacific:	Not necessary, but will consider for harmonisation

Crabbed / Perpendicular Impact Configuration

NHTSA:	US believe that a crabbed test shows a better relationship between different vehicle types

Transport Canada:	Flexible – would like to see additional data on barrier performance in crabbed impact
OICA NTH. AMER.:	Preference for perpendicular impact, with US width barrier – not totally against crabbed impact but concerned about movement and shear of blocks
OICA Europe:	Open to both, with a preference for perpendicular
JMoT:	Perpendicular
OICA Asia Pacific:	Perpendicular, but would consider crabbed for harmonisation
EEVC:	Perpendicular – to maximise front dummy loads, investigate means of increasing load on rear dummy
Australia:	As per EEVC

Homogeneous / Non-homogeneous Element

NHTSA: Homogeneous works fine, haven't seen any problems
- procedure would determine appropriateness of a non-homogeneous barrier
- flexible, depending upon element research – if homogeneous realistically maximised loads

Transport Canada: US barrier doesn't work – corner effects
Homogeneous would be satisfactory if there is one that works realistically for rear occupants
Barrier needs to be "realistic" – not inducing artefacts

EEVC: Prefers non homogeneous to be realistic, but must result in effective remedial measures not solutions just to meet particular test conditions.

There was a general consensus that either a homogeneous or non-homogeneous element could be suitable, subject to further validation, provided that a realistic intrusion profile could be produced by the chosen design.

Element Stiffness

OICA NTH. AMER.:	Consider that European-type stiffness would be acceptable
Transport Canada:	Agreed – subject to further validation
NHTSA:	To be advised – would need further evaluation
OICA Europe:	Flexible, with a view to harmonisation
JMoT:	Based on current (European) barrier, but must be based on current fleet to be realistic
OICA Asia Pacific:	Similar to OICA Europe, but cost of barrier face should also be considered

Mass of Trolley

NHTSA:	Do not believe mass should be specified
EEVC:	Would be comfortable with up to 1500kg
Transport Canada:	Do not believe mass is a big issue, happy with the 1500kg suggestion

JMoT:	Based on research and the Japanese fleet believe mass should be 1250kg
OICA Asia Pacific:	Agree with JMoT
OICA Europe:	Does not believe that these parameters should be changed in isolation – mass would depend on barrier configuration etc Up to 1500kg would be acceptable

Mr Kanianthra undertook to establish the US average fleet mass.

Ground Clearance

As an action from the previous meeting, Mr Justen presented an FE simulation based on the current E-class Mercedes Benz to examine the effects of increasing the barrier ground clearance from 300 mm to 450 mm. The main points were:

- Estimated effective deployment of the (door-mounted) sidebags not possible because of the very high intrusion velocity.
- Extreme rear door loading in FMVSS 214 configuration.

Indicative countermeasures together with mass penalties are:

- Massive stiffening of the B-pillar and associated structure to maintain vertical intrusion profile and promote load transfer. 10 kg.
- Strengthen roof to improve load transfer. 9 kg.
- Activation of seat and non-struck side structure (seat, door, x-member). 8.5 kg.

Total mass increase of about 35 kg.

EEVC:	350mm ground clearance – but would not want to see top height raised, as only passenger cars are being considered
OICA Asia Pacific:	Consider current (300mm) is sufficient, or new face design
JMoT:	Need to increase ground clearance to 375mm From fleet survey believe optimum ground clearance between 300 & 350mm
OICA Europe:	Propose a bumper element at 350 – 400mm with the base remaining at 300mm
EEVC:	Interested in idea of a bumper, or a trailing lower structure
OICA NTH. AMER.:	Between 300 and 350mm
Transport Canada:	Suggest 350 – 400mm Would consider investigating use of bumpers
NHTSA:	Top of barrier needs to be raised for head strike – will investigate further
Transport Canada:	Suggest a ‘tube’ or similar structure above element to evaluate head strike

Non Struck Side Test

EEVC:	Suggest possibility of a sub-system test

Consensus: Defer to future consideration of SIWG.

Seat Position

Transport Canada: To provide equation for determining seating position of 5th %ile Female Driver

Barrier Face Centring

To be at or related to R-point for a perpendicular impact.
Yet to be determined for a crabbed impact.

Barrier Dimensions

Transport Canada: Suggest similar width to current US barrier
EEVC: Weaker edge elements would prevent bridging
US width (1676mm) satisfactory, subject to testing
JMoT: Need to consider, subject to testing

Pole Test

Transport Canada: Requirement for international profile of pole impacts and pole sizes
EEVC: Favour a wider pole – for repeatability

This ended the discussion of the position paper.

10. NEXT MEETING

The next meeting will be on Monday 25 and Tuesday 26 September in conjunction with the IRCOBI Conference - in Montpelier or another place in France. Mr Lowne to consult Dominique Cesari for suggested venue.

The subsequent meeting was tentatively scheduled for 11/12 December 2000 in Australia in conjunction with the WorldSID workshop.

Mr Seyer reiterated that the draft report (including a status report) of the Working Group would be circulated by 31 July, for a 3 week comment period.

11. MEETING CLOSED.

MARK TERRELL
25 September 2000